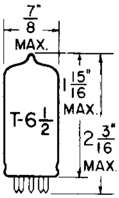
TUNG-SOL

TWIN TRIODE

MINIATURE TYPE



GLASS BULB

COATED UNIPOTENTIAL CATHODE

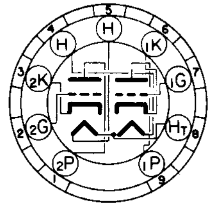
HEATER

6.3 VOLTS 0.9 AMP.
12.6 VOLTS 0.45 AMP.

AC OR DC

ANY MOUNTING POSITION

FOR 12.6 VOLT OPERATION APPLY HEATER VOLTAGE BETWEEN PINS #4 AND #5. FOR 6.3 VOLT OPERATION APPLY HEATER VOLTAGE BETWEEN PIN #8 AND PINS #4 AND #5 TIED TOGETHER.



BOTTOM VIEW
MINIATURE BUTTON
9 PIN BASE

9H

THE 5687WA IS A RUGGEDIZED, GENERAL PURPOSE MEDIUM-MU TWIN TRIODE OF THE MINIATURE BUTTON 9-PIN ALL GLASS CONSTRUCTION. EACH TRIODE SECTION IS ELECTRICALLY INDEPENDENT, ALTHOUGH THE TWO HEATERS HAVE A COMMON CONNECTION PERMITTING EITHER A 6.3 OR 12.6 VOLT OPERATION. THIS TYPE HAS HIGH PERVEANCE AND HIGH EMISSION CAPABILITIES WHICH ALLOW VERY HIGH PLATE CURRENT PULSES IF A SUITABLE SHORT DUTY CYCLE IS EMPLOYED. THE CATHODE MATERIAL IS CHOSEN TO MINIMIZE INTERFACE FORMATION, THUS MAKING THE 5687WA IDEAL FOR TRIGGERED APPLICATIONS INVOLVING LONG PERIODS OF STAND-BY CUT-OFF SERVICE. SINCE IT MUST BE ABLE TO WITHSTAND SEVERE MECHANICAL TESTS TO MEET TEST SPECIFICATIONS, THE 5687WA IS ESPECIALLY SUITED FOR USE IN INDUSTRIAL AND MILITARY AIRBORNE EQUIPMENT WHICH MAY BE SUBJECTED TO SEVERE SHOCK AND VIBRATION.

DIRECT INTERELECTRODE CAPACITANCES

EACH TRIODE UNIT

	WITHOUT SHIELD	
GRID TO PLATE (RATED)	4.0	μμf
GRID TO CATHODE (RATED)	4.0	μμf
PLATE TO CATHODE (RATED)		
SECTION #1	0.6	μμf
SECTION #2	0.5	μμf
HEATER TO CATHODE (RATED)	8.0	μμf
PLATE TO PLATE (APPROX.)	0.75	μμf
GRID TO GRID (APPROX.)	0.025	μμf

RATINGS

ABSOLUTE MAXIMUM VALUES

HEATER VOLTAGE	6.3±5%	12.6±5%	VOLTS
MAXIMUM DC PLATE VOLTAGE	330		VOLTS
MAXIMUM PLATE DISSIPATION, EACH PLATE[A]	4.2		WATTS
MAXIMUM DC HEATER-CATHODE VOLTAGE	±100		VOLTS
MAXIMUM DC CATHODE CURRENT, EACH SECTION[B]	65		mAdc
MAXIMUM BULB TEMPERATURE	+225		°C

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CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

E_f = 12.6V, E_b = 120Vdc, E_c =-2Vdc
(EXCEPT AS MODIFIED BELOW)

	INITIAL				500 HOUR LIFE TEST		
	INDIVIDUAL MIN.	INDIVIDUAL MAX.	PROD. MIN.	AVG. MAX.	INDIVIDUAL MIN.	INDIVIDUAL MAX.	
HEATER CURRENT (E_f = 6.3V)	0.82	0.94	---	---	0.80	0.96	AMP.
HEATER CATHODE LEAKAGE[C] (E_{hk}=±100Vdc)	---	±30	---	---	---	±50	µAdc
GRID CURRENT (1)[C] (R_g = 0.5MEG)	---	-1.5	---	---	---	-2.0	µAdc
PLATE CURRENT (1)	27	45	33	39	---	---	mAdc
INSULATION OF ELECTRODES (E_f=12.6V, E(g-all)= 300Vdc, E(g-neg., E(p-all)= 500 Vdc, P neg.) R(g-all)	100	---	---	---	50	---	MEGOHM
R(p-all)	100	---	---	---	50	---	MEGOHM
PLATE CURRENT (2) (E_b=300Vdc, E_c=-20Vdc)	---	6.0	---	---	---	---	mAdc
PLATE CURRENT (3) (E_b=300Vdc, E_c=-25Vdc)	---	1.0	---	---	---	---	mAdc
TRANSCONDUCTANCE (2)[D]	---	15	---	---	---	15	PERCENT
GRID CURRENT (2)[E] (E_f = 14.0V)	---	-5.0	---	---	---	---	µAdc
PLATE EMISSION[F] (E_b=195Vac, R_k/I_b= 10.5 mVdc, E_c = 0	---	25	---	---	---	---	µAdc
AMPLIFICATION FACTOR	16	21	---	---	---	---	
TRANSCONDUCTANCE (1)	---	---	10000	12000	6000	14000	µMHOS
Δ AVERAGE TRANS-CONDUCTANCE (1)	---	---	---	---	---	15	PERCENT

SPECIAL REQUIREMENTS

	MIN.	MAX.	
VARIABLE FREQUENCY VIBRATION[G] (R_p=2,000)	---	100	mVac
VIBRATIONAL FATIGUE[H]	---	---	
SHOCK[J] (HAMMER ANGLE =24°, SHORT INDICATOR EMPLOYED)	---	---	
POST SHOCK AND VIBRATIONAL FATIGUE TEST END POINTS			
LOW FREQUENCY VIBRATION	---	150	mVac
HEATER-CATHODE LEAKAGE	---	±50	µAdc
TRANSCONDUCTANCE (1)	6 000	---	µMHOS
GRID CURRENT (1)	-3.0	---	µAdc
GLASS STRAIN[K]	---	---	
CONTINUITY AND SHORT[L]	---	---	
AF NOISE[MNPQ] (E_f=12.6Vdc, E_{bb}=300Vdc, E_c=0, E_{cal}=70mVac)	---	17	VU
LOW FREQUENCY VIBRATION[RQ] (R_p=2000)	---	100	mVac
LOW PRESSURE VOLTAGE BREAKDOWN[S] (PRESSURE = 55±5 mm mercury, TEMP.=25±5°C) HUMIDITY=0, VOLTAGE - 500Vac, 60 CYCLES, SINUSOIDAL WAVE FORM)	500	---	Vac
1 HOUR STABILITY LIFE TEST (INTERMITTENT LIFE TEST CONDITIONS)	---	---	
STABILITY LIFE TEST END POINTS TRANSCONDUCTANCE (1)	---	10	PERCENT
100 HOUR SURVIVAL RATE LIFE TEST (INTERMITTENT LIFE TEST CONDITIONS OR EQUIVALENT)	---	---	
SURVIVAL RATE LIFE TEST END POINTS PLATE CURRENT (1)	---	45	mAdc

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SPECIAL REQUIREMENTS -CONT'D.

	MIN.	MAX.	
HEATER CYCLING LIFE TEST (E_f=7.5V, E_{hk}=135Vdc, HEATER POSITIVE, E_b=E_c=0)	---	---	
HEATER CYCLING LIFE TEST END POINTS [T] HEATER-CATHODE LEAKAGE	---	±30	µAdc
INTERMITTENT LIFE TEST [P] (E_{hk}=135Vdc, HEATER POSITIVE, R_g=1.0 MEG., E_c= 0, MIN. BULB TEMP. =+225°C, R_k=68 OHMS)	---	---	

NOTES

[A] MAXIMUM TOTAL DISSIPATION FOR BOTH SECTIONS SHALL BE 7.5 WATTS.

[B] R_g MAX. 1.0 MEG WITH CATHODE BIAS; 0.1 MEGOHM WITH FIXED BIAS.

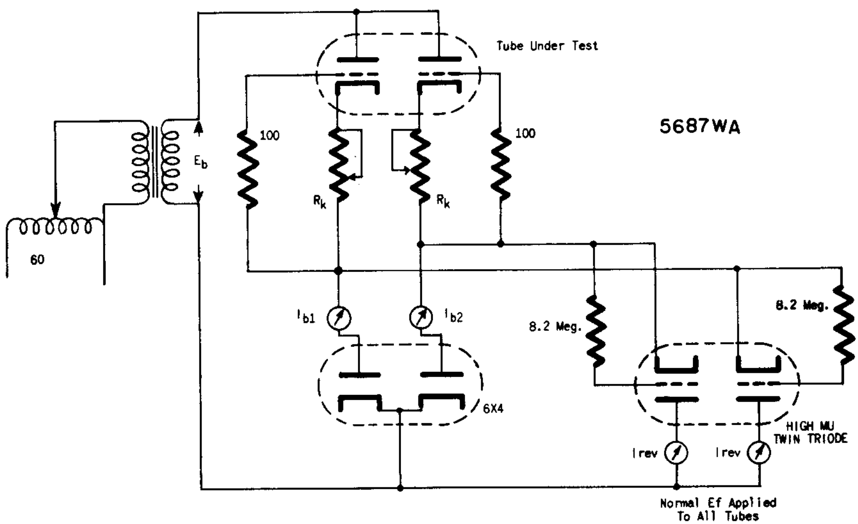
[C] TIE 1_p TO 2_p, 1_g TO 2_g, 1_k TO 2_k. (PARASITIC SUPPRESSORS OF 50 OHMS MAXIMUM PERMITTED.)

[D] THE VALUE OF TRANSCONDUCTANCE (2) SHALL APPLY TO INDIVIDUAL TUBES AND IS EXPRESSED:

$$\frac{(SM\ AT\ 12.6)-(SM\ AT\ 11.4)}{(SM\ AT\ 12.6)} \times 100$$

[E] PRIOR TO THIS TEST TUBES SHALL BE PREHEATED AT FOLLOWING CONDITIONS AND TESTED IMMEDIATELY AFTER PREHEATING. E_f=14.0V, E_{c1}=-2Vdc, R_k=0 OHM, E_b=120Vdc, R_g=1.0 MEG.

[F] TIE GRIDS TO NEGATIVE END OF INDIVIDUAL Rk THRU INDIVIDUAL 100 OHM RESISTORS. ADJUST INDIVIDUAL Rk FOR SPECIFIED FORWARD PLATE CURRENT ±5% AS MEASURED ON THE FORWARD HALF CYCLE OF PLATE VOLTAGE. AFTER A MINIMUM OF 5 MINUTES OPERATION AS ABOVE, IMMEDIATELY MEASURE REVERSE PLATE CURRENT ON THE REVERSE HALF CYCLE OF PLATE VOLTAGE.



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NOTES -CONT'D.

[G] SEE MIL-E-1C 4.9.20.3

[H] SEE MIL-E-1C 4.9.20.6

[J] SEE MIL-E-1C 4.9.20.5

[K] GLASS STRAIN TEST SHALL CONSIST OF COMPLETELY SUBMERGING THE TUBE INTO BOILING WATER (97°-100°C) FOR A PERIOD OF 15 SECONDS, THEN IMMEDIATELY PLUNGING INTO COLD WATER (0°±3°C). THE AMOUNT OF WATER SHALL BE AT LEAST 2 LITERS PER 15 TUBES. TUBES FOR THIS TEST SHALL HAVE BEEN EXHAUSTED A MINIMUM OF 48 HOURS PRIOR TO PERFORMANCE OF THIS TEST. TUBES SHALL BE REJECTED FOR EVIDENCE OF AIR LEAK.

[L] SEE MIL-E-1C 4.7.5

[M] SEE MIL-E-1C 4.10.3.2

[N] THE CATHODE RESISTOR SHALL BE SHUNTED WITH A CAPACITIVE REACTANCE NOT EXCEEDING 3 OHMS @ 60 CYCLES.

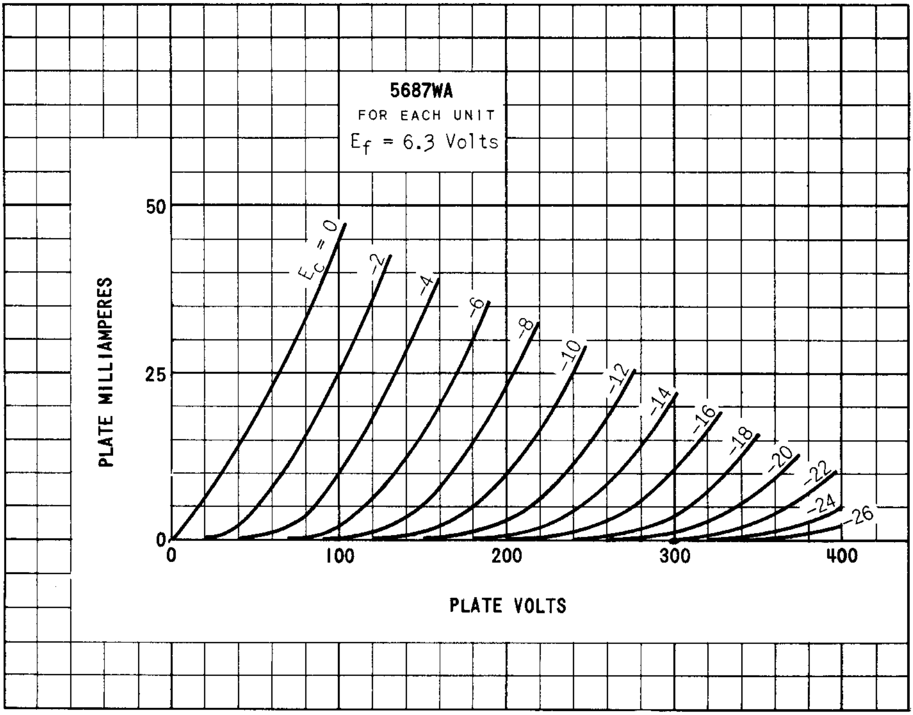
[P] R_p=2000 OHMS. E_{cal}=70mV FOR 17VU METER DEFLECTION INITIALLY. PARAGRAPH 4.10.3.2 OF MIL-E-1C IS AMMENDED AS FOLLOWS: THE FIFTH SENTENCE SHALL READ: THE GAIN OF THE POWER AMPLIFIER (SEE FIGURE 30) SHALL BE ADJUSTED BY REMOVING THE TUBE FROM THE SOCKET AND INTRODUCING THE SPECIFIED CALIBRATING VOLTAGE (SINE WAVE) THRU A CAPACITOR AND NOT MORE THAN 100 OHMS AT THE CALIBRATING FREQUENCY. THE POWER AMPLIFIER GAIN SHALL BE ADJUSTED FOR POWER OUTPUT LEVEL OF 17VU, (50MW).

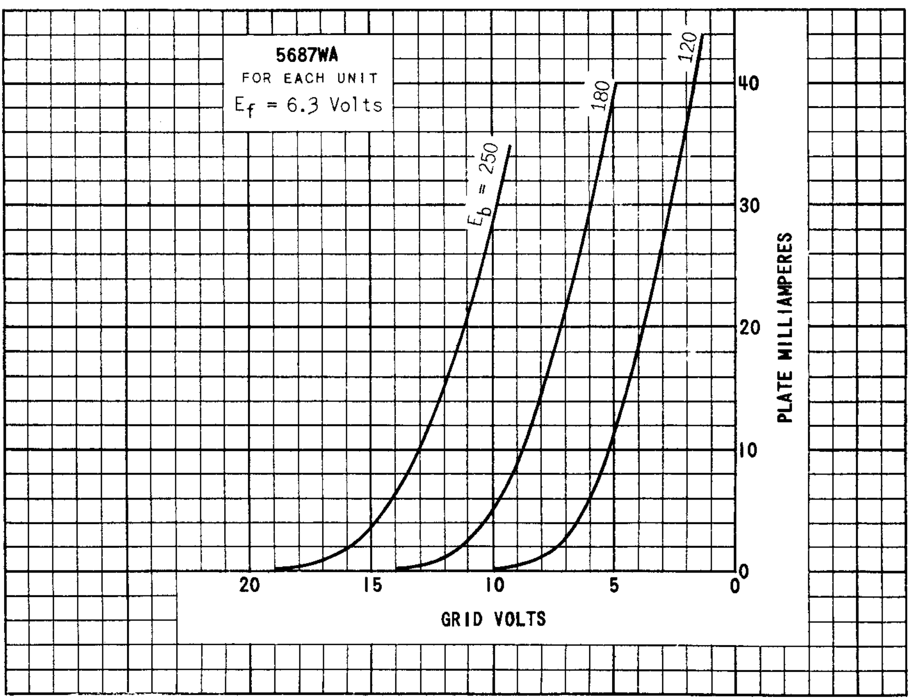
[Q] TIE PLATES TOGETHER. TIE GRIDS TOGETHER AND TO GROUND THRU A 1.0 MEG. RESISTOR. TIE CATHODES TOGETHER AND TO GROUND THRU A 680 OHM RESISTOR.

[R] SEE MIL-E-1C 4.9.20.4

[S] BREAKDWON SHALL BE DEFINED AS THAT VOLTAGE AT WHICH ARCING OCCURS BETWEEN ANODE BASE PIN AND ADJACENT PINS.

[T] AT THE CONCLUSION OF THE HEATER CYCLING LIFE TEST, A TEST SHALL BE MADE TO DETERMINE CATHODE CONTINUITY. A TUBE WHICH FAILS THE CATHODE CONTINUITY TEST SHALL BE CONSIDERED A DEFECTIVE TUBE FOR THE HEATER CYCLING LIFE TEST.


5687WA
FOR EACH UNIT
Ef = 6.3 Volts
PLATE MILLIAMPERES
50
25
0
Ec = 0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
0
100
200
300
400
PLATE VOLTS


5687WA
FOR EACH UNIT
Ef = 6.3 Volts
Eb = 250
180
120
40
30
20
10
0
PLATE MILLIAMPERES
20
15
10
5
0
GRID VOLTS

5687WA
PREMIUM TUBE

